MINOR NOTICES

Botany and Pharmacognosy.—A third edition of KRAEMER'S *Textbook*[2] has appeared with great promptness after the publication of the second.[3] The changes made have to do chiefly with the illustrations, fifty unsatisfactory half-tones being replaced by line drawings, and several new illustrations being introduced, especially of solanaceous drugs and plants.—J. M. C.

NOTES FOR STUDENTS

Chlorophyll and assimilation.—LUBIMENKO, who has been devoting his attention to the influence of light upon various processes, has endeavored to solve these questions: Is the intensity most favorable for the decomposition of H_2CO_3 likewise the most favorable for the production of dry matter? What is the optimum illumination which will produce the most dry matter in different green plants? How is this optimum related to the various quantity of chlorophyll in the leaves? He reports[4] that the production of dry matter is determined by the light energy absorbed, which in turn varies with the illumination and the quantity of chlorophyll in the leaves. The latter is not constant, but varies with the illumination. In nature the minimal quantity of chlorophyll in all species studied corresponds to the normal daylight undiminished. As the light is weakened the quantity is rapidly increased until it attains a maximum; then it diminishes with still weaker light. In any species the maximum is reached with weaker light as the temperature rises. As to this matter, two classes of plants may be distinguished: those that produce little chlorophyll, whatever the external conditions, and those that accumulate a good deal. In the former the quantitative variations in chlorophyll due to illumination and temperature are smaller than in the latter, which also for the production of a maximum quantity require a more feeble light than the former. In general the maximum of pigment corresponds to a light sensibly weaker than that required for a maximal production of dry matter. From which it would appear that light, as inferred for other reasons, has a special action in the formation of chlorophyll.

The production of dry matter increases with the light absorbed, up to a maximum, then diminishes. This optimal light is constant with the same species at constant temperature, but diminishes as the latter increases. [This indicates that the energy optimum is a constant.] The optimal intensity for the production of dry matter varies according to the quantity of chlorophyll, augmenting as the pigment diminishes, and *vice versa*. In nature the maximal production in plants poor in chlorophyll corresponds to the normal daylight, but in those

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[2] KRAEMER, HENRY, A textbook of botany and pharmacognosy. Third edition. pp. viii+850. *figs. 328*. Philadelphia and London: J. B. Lippincott Co. 1908.

[3] Reviewed in BOT. GAZETTE **46**:231. 1908.

[4] LUBIMENKO, W., Production de la substance sèche et de la chlorophylle chez les végétaux supérieures aux différents intensités lumineuses. Ann. Sci. Nat. Bot. IX. **7**:321–415. 1908.

rich in pigment it corresponds to a greatly weakened light. In general the development of the plant is proportional to the dry matter produced; but growth is not exactly proportional thereto, for it is more feeble in strong light and more vigorous in weak light than it would seem if it were measured by the augmentation of the dry weight. The root and stem are unequally affected; the former grows more and the latter less as the illumination increases; but too strong a light reduces the rate of growth of both because less food is produced. The development of the leaf blades generally increases to a maximum with decreasing light, but diminishes with further enfeeblement. With some exceptions transpiration does not have any sensible effect on the total production of dry matter, though the quantity in proportion to the fresh weight generally diminishes with the diminished light.

All the green plants are capable of regulating the quantity of light absorbed, and so partly avoiding the injurious effect on production of dry matter, by altering the quantity of chlorophyll produced. These adaptations are limited in plants poor in chlorophyll; but those rich in pigment can adjust themselves to a relatively very weak illumination. Biologically the massing of plants ought to be an advantage by reducing the illumination. Physiologically the action of light is not limited to the reduction of H_2CO_3, for it affects also the speed of incorporation [assimilation] of carbohydrates. The former demands a stronger light than the latter, for which there is an optimum, and below and above this it rapidly diminishes in rate. It is by this retarding action of bright light upon the incorporation of carbohydrates and a consequent considerable accumulation of foods in the green tissues that the diminution in the production of dry matter is explicable when the illumination passes a certain limit. [This explanation does not explain and surely needs further consideration.] If the chemical transformations which constitute the incorporation of carbohydrates are of enzymic nature, it is probable that they are affected by the action of light on the formation and destruction of enzymes. [Is not the fate of the greater part of the carbohydrates to be sought rather in protein synthesis than in "incorporation;" and is there any evidence of enzymic action in this process?]—C. R. B.

Self-digestion and endospermic respiration.—The long effort to settle the question of the vitality of the endosperm, which was begun by GRIS and VAN TIEGHEM, was practically abandoned after the culminating researches of BROWN and ESCOMBE, PURIEWITSCH, and BROWN and MORRIS. Since that time very little indeed has been contributed to the subject. Perhaps one reason was that the results of somewhat related investigations so modified our knowledge of enzymes and respiration that self-digestion as a test of vitality was no longer regarded as valid. Altogether disregarding such opinions, BRUSCHI[5] takes up the problem practically as it was first attractive fifty years ago, "to solve the

[5] BRUSCHI, DIANA, Researches on the vitality and self-digestion of the endosperm of some Graminaceae. Annals of Botany **22**:449–463. 1908.